

REMARKS

Claims 1 to 32 are all the claims pending in the application, prior to the present Amendment.

Claims 1-32 have been rejected under 35 U.S.C. §103 as being unpatentable over Ohmori et al in view of Tanaka et al.

In the Advisory Action of January 28, 2010, the Examiner additionally relies on the newly cited U.S. Patent 6,485,701 to Miyoshi to demonstrate that oxide having perovskite structure demonstrate ferroelectricity when a titanium oxide of anatase is used. The Examiner asserted that it is thus expected that a titanium oxide having a high amount of anatase form would exhibit ferroelectricity.

Applicants submit that Ohmori et al, Tanaka et al and Miyoshi do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

The present invention as set forth in claim 1 is directed to a method for producing a titanium-containing perovskite compound, wherein the method comprises a step of reacting titanium oxide produced through a vapor-phase method with at least one element selected from a group of alkaline earth metal compound and Pb compound in an alkaline solution, wherein when the titanium oxide contains rutile titanium oxide, the content of anatase titanium oxide is 20 to 100 mass%. Thus, applicants have amended claim 1 to recite that when the titanium oxide contains rutile titanium oxide, the content of anatase titanium oxide is 20 to 100 mass%. Support for this amendment can be found at page 14, lines 3 to 16 of the present specification. Applicants have also added new independent claim 33 to recite that the titanium oxide contains

at least 80 mass% of anatase titanium oxide. Claim 17 is directed to the compound produced by the method of claim 1.

The titanium-containing perovskite compound produced according to the method of the present invention exhibits ferroelectricity and has high heat resistance and excellent dispersibility. See page 13, lines 17-23, page 12, lines 18-21, and page 24, lines 2-6. As disclosed in the present specification, when a titanium-containing perovskite compound is synthesized by a method employing a titanium oxide sol, the perovskite exhibits paraelectricity. See page 23, lines 1-6 of the present specification. The heat resistance and dispersibility of such a perovskite is inferior to one obtained by the present invention.

Ohmori et al disclose a process for producing a perovskite titanium-containing composite oxide from a starting titanium oxide. Ohmori et al disclose that the preferred method for producing the starting titanium oxide is to produce a titanium oxide sol by subjecting a titanium salt to hydrolysis in an acid solution.

The Examiner relies on Tanaka et al for the disclosure of a method of producing titanium oxide by a vapor-phase method to produce particles with little aggregation and having highly excellent dispersibility. The Examiner argues that it would have been obvious to employ the Tanaka et al method to produce the starting titanium oxide that is employed in Ohmori et al.

Although Tanaka et al disclose that a vapor-phase method produces titanium oxide having less aggregation and highly excellent dispersibility, Tanaka et al do not disclose or suggest that such a titanium dioxide should be used in a method to produce a titanium-containing perovskite that exhibits ferroelectricity, and which has high heat resistance and excellent dispersibility.

The present specification contains evidence that the use of a vapor-phase method for obtaining the starting titanium oxide produces unexpected results in the production of a titanium-containing perovskite compound, as compared to the use of a titanium oxide produced by a sol technique such as in Ohmori et al.

Comparative Example 1 of the present specification discloses a sol method of forming titanium oxide, such as in Ohmori et al, but the barium titanate formed from the use of such a titanium oxide sol exhibited no ferroelectricity and had inferior heat resistance (18% shrinkage) and dispersibility ($D_{90} = 3.3 \mu\text{m}$). See page 43, lines 4-5, page 43, lines 9-10, and page 43, lines 18-22. See page 18, lines 16-20 for a discussion of D_{90} as a measure of dispersibility. Example 1 of the present specification, which is directly comparable to Comparative Example 1 of the present specification, shows that use of a vapor phase titanium oxide produces a barium titanate having ferroelectricity, better heat resistance (10% shrinkage) and better dispersibility ($D_{90} = 0.50 \mu\text{m}$). See page 34, lines 16-17, page 34, lines 29-30, and page 35, lines 15-16.

Thus, by comparing the results of Comparative Example 1 of the present specification, which is comparable to Example 1 of Ohmori et al in the formation of the titanium oxide by a sol technique, with the results of Example 1 of the present specification, it can be seen that the method of the present invention produces unexpected results.

The Examiner responds to applicants' arguments of unexpected results by stating that as to the claim that the present invention exhibits ferroelectricity and high heat resistance and excellent dispersibility, the fact that applicants have recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. The Examiner cites *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985) in support of her position.

The Examiner further states as follows in support of her position:

... Tanaka suggests the vapor-phase method is better than the liquid phase process for titanium oxide which results in ultra fine and uniform particles which are excellent for UV light shielding and photocatalyst application with excellent dispersibility and no coagulation. Ohmori teaches that fine titanium oxide particles which have good dispersibility will result in excellent photocatalytic activity therefore the high heat resistance and ferroelectricity characteristics of the final product is merely another recognized advantage which would flow from the suggestion of the prior art. (Emphasis in the original.)

Applicants submit that the *Ex parte Obiaya* case that the Examiner cites, and which has not been cited by any authority subsequent to its issuance, does not lead to the conclusion that the present invention is obvious. In particular, the Board of Appeals and Interferences stated as follows in *Obiaya*:

Appellant has presented evidence to indicate that a shorter response time is obtained when a labyrinth heater is employed, this being an unexpected result. However, the references disclosing labyrinth heaters indicate that the advantage obtained by using such heaters is that samples are maintained at a uniform temperature. The fact that appellant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. Note *In re Best*, 562 F.2d 1252, 195 USPQ (CCPA 1977) and *In Re Wilder*, 429 F.2d 447, 166 USPQ 545, (CCPA 1970).

Thus, the *Obiaya* case relies on two previous decisions for the proposition that an applicant who "has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot [rely on this advantage] as a ... basis for patentability when the differences would otherwise be obvious." However, neither one of these cases support this proposition.

In the *Best* case, the question was one of inherency over a single reference. The CCPA found that appellants had not presented sufficient evidence to show that the reference did not inherently have the unexpected property. In the present case, the rejection is one of obviousness

based on the combined teachings of two references. Moreover, in the present case, applicants have presented evidence to show that the reference does not have the unexpected property.

Further, applicants submit that the above obviousness analysis of the Examiner is flawed because it is based on an inherency argument that results from the combining of the teachings of two references. There are many legal decisions that indicate that inherency cannot be relied on to show obviousness. See, for example, *In re Newell*, 13 USPQ2d 1248, 1250 (Fed. Cir. 1989); *In re Naylor*, 152 USPQ 106, 108 (CCPA 1966); *In re Spormann*, 150 USPQ 449, 452 (CCPA 1966).

As stated in *Spormann*, the inherency of an advantage and its obviousness are entirely different questions. As stated in *Spormann*, “[t]hat which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.” *In re Spormann*, 363 F.2d 444, 448, 150 USPQ 449, 452 (CCPA 1966). See also, *In re Rijckaert*, 9 F3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993); *In re Dillon*, 919 F2d 688 16 USPQ2d 1897 (Fed. Cir. 1990).

In the *Wilder* case, the CCPA found that the invention was not obvious over a single reference, and stated as follows:

... the mere fact that an applicant has discovered an *unexpected property* in a compound which is structurally similar to that disclosed in the prior art is not enough, in and of itself, to make his claimed subject matter unobvious. The law is clear in requiring a showing of unexpected *differences* between the properties of the compound recited in the instant claimed composition and those possessed by the prior art.

However, we can see no reason why such differences and their unexpected nature may not be demonstrated by other than a direct comparison. The problem is simply one of evidence and it should be a simple matter to accord various types of proofs their appropriate weight. In the present case, appellant's indirect, circumstantial evidence has satisfied us that the composition of claim 7, more likely than not, does possess properties *different from* those possessed by a composition containing the seven-carbon isomer disclosed by the reference and that such differences would have been unexpected to one having ordinary skill in the art. We hold, therefore, that he has overcome the prima facie showing made by the Patent Office and that the rejection of claim 7 under 35 U.S.C. 103 should be *reversed*.

Similar to the decision in *Best*, applicants have presented evidence that the claimed product possesses different properties from those possessed by the prior art Ohmori et al reference, and that such differences would have been unexpected.

With respect to the unexpected difference, it appears that the Examiner may be arguing that because Tanaka et al disclose that their particles can be used as a photocatalyst, this means that the Tanaka et al particles have ferroelectricity. However, applicants have not found any reference proving that titanium dioxide exhibits ferroelectricity under normal conditions. Accordingly, it can be assumed that titanium dioxide does not have ferroelectricity.

Moreover, the present invention does not relate to the titanium oxide particles of Tanaka et al, but to a titanium-containing perovskite. There is no teaching or suggestion that the titanium-containing perovskite would have the same properties as the titanium oxide from which it is made.

In response to applicants' arguments concerning ferroelectricity, the Examiner, in the Advisory Action, newly cites Miyoshi as showing that an oxide having a perovskite structure, such as barium titanate, and made from the anatase form of titanium oxide, have ferroelectricity. The Examiner argues it is therefore expected that titanium oxide having a high amount of anatase form would exhibit ferroelectricity.

Applicants submit that Miyoshi supports applicants' position. In particular, Miyoshi disclose that barium titanate prepared by a conventional wet method does not have sufficient ferroelectricity. Miyoshi disclose that in order to prepare a barium titanate having sufficient ferroelectricity, a method is employed in which a metallic oxide powder having a particular specific surface area and a metallic carbonate powder are mixed, and then heat treated at a

specific partial pressure of oxygen. In other words, Miyoshi disclose that special manufacturing conditions are necessary, but Miyoshi do not disclose or suggest that the method of the present invention can be used to obtain ferroelectricity.

In addition, the Examples of Miyoshi teach that a TiO_2 powder made of anatase TiO_2 was used, although a TiO_2 powder made of rutile TiO_2 or TiO_2 of a mixture of anatase and rutile may be used so as to produce a similar effect. See column 9, lines 47 to 31. That is, Miyoshi show that using anatase TiO_2 as a material does not relate to ferroelectricity of the product thereof.

Miyoshi does not indicate how the titanium oxide employed in the Miyoshi invention was prepared, and does not indicate that the method of preparing the titanium oxide has any effect on their method.

Applicants point out further that claims 1 and 33 recite a step of reacting titanium oxide in an alkaline solution. Therefore, applicants submit that the present invention is distinguished over the solid-phase method of Miyoshi.

In the Advisory Action, the Examiner also points out that the present specification indicates, starting at page 43, that Comparative Example 2 employed a vapor phase titanium oxide as in the present invention, but did not achieve ferroelectricity because the titanium oxide had a low anatase content. The Examiner states that the present specification shows that ferroelectricity is obtained only at a 80% or higher of anatase, but that the present claims do not claim the amount of anatase necessary to obtain ferroelectricity.

In response, as discussed above, applicants have amended claim 1 and have added new claim 33.

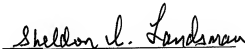
Comparative Example 2 of the present invention shows that ferroelectricity cannot be detected when the titanium oxide is poorly reacted with an alkaline earth metal compound and when the titanium oxide is more readily reacted with an alkaline earth metal compound, ferroelectricity can be detected. See page 14, lines 3 to 16 of the present specification.

In view of the above, applicants submit that Ohmori et al, Tanaka et al and Miyoshi do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,


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